

THE IMPACT OF EARLY SCREEN EXPOSURE ON THE DEVELOPMENT OF SOCIAL INTERACTION AND COMMUNICATION IN CHILDREN

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Abstract

Social communication is the exchange of information, thoughts, emotions and intentions between people in a social context, through verbal and non-verbal means. It is the basis of human interaction and involves much more than just speaking – it includes understanding, adaptation and cooperation in real social situations.

Objective: The aim of this research is to examine the impact of the time and period of screen exposure on the development of social interaction and communication in children from an early age.

Method: The research included three groups of children depending on the period of screen exposure: (1) exposed before the first year, (2) exposed between the first and second year, and (3) exposed after the age of two. A total of 66 children were included, whose behavior was assessed through structured observation and analysis of parameters such as: visual contact, responsiveness to name calling, joint attention, social isolation, and type of play (functional, stereotyped, imaginative).

Results: Children from the first and second groups showed significant deficits in all domains of social communication and interaction. It is particularly concerning that joint attention and imaginative play were completely absent in 100% of the children in these two groups. No disorders were recorded in the third group. All children established adequate eye contact, responded to their name, and demonstrated joint attention and imaginative play.

Conclusion: Early exposure to screens (before the second year of life) is associated with serious impairments in social interaction and symbolic play in children. The time period of exposure appears to be a key factor for the potential risk.

Keywords: screen exposure, social communication, joint attention, play, early childhood, developmental risk

Introduction

Social communication is a key aspect of every child's development, enabling them to successfully establish and maintain interaction with others, express their thoughts and feelings, and understand the verbal and nonverbal messages of their interlocutors. It involves the exchange of emotions, experiences, opinions, and knowledge. The process of socialization is a dynamic learning process through which a child gains experiences and adopts patterns of behavior, perception, and communication accepted in the community in which they grow up. These changes occur through social interaction, which is a living and mutually influential process between the child and others. As Mlinarević and Tomas (2010) emphasize, "social interaction between adults and children, as well as among children themselves, is a constructive factor in development, and it is through this process that complex emotions are formed and various social skills are developed." (Mlinarević i Tomas, 2010: 146; Babić, Irović, 2004).

Early sensitivity to social stimuli, i.e. the preference for the characteristics of stimuli that come from other people (such as face, voice and touch), over those that come from the physical environment, together with the biologically predetermined capacity for emotional bonding, enable the newborn to establish the first social interactions immediately after birth, even before developing the basic means of communication. On the other hand, the biological readiness of adults implies the ability and sensitivity to recognize and respond appropriately to the signals sent by the baby (Matejić Đuričić, 2012: 279). The fact that a person is a priori a social being does not mean that he does not need socialization. On the contrary, it is through the process of socialization that children adopt the forms of behavior and experience that are characteristic of the social environment in which they live. Through this process, among other things, they learn how to appropriately express their emotions. Children acquire socially acceptable forms of behavior in a social context, through verbal and nonverbal communication, observation and imitation. Interactions that are not in line with accepted social norms most often lead to misunderstandings, and not infrequently to emotional and behavioral difficulties (Vučinić et al., 2013).

The social and emotional development of a child is deeply connected and takes place in constant dynamic interaction. Emotions affect all psychological functions and aspects of life, acting as a universal regulator of behavior (Šimgaeva, 2007). They connect the child with the social environment and establish a bridge between the organic and the psychological. The emotional development of a child begins in the first days of pregnancy. The way it will unfold depends on the climate in which the pregnant woman lives, the parents' attitude towards the child, their understanding of what is happening to him, the parenting styles of both parents, as well as hereditary factors (Lobina, 2007). The idea that the newborn's need for close contact with another person is primary, as important as the need for food, has been confirmed by numerous experimental studies. This need is satisfied through affective attachment to the mother or to the person who replaces her role.

Affective attachment precedes the establishment of mental connections (Valon, 1990), that is, the development of theory of mind, and has a significant impact on the capacity for social intelligence. Early affective connections are the foundation of all later social interactions.

The founder of the theory of affective attachment, John Bowlby, argued that the first emotional connections are the basis of all future relationships – friendships, partnerships and others. It was believed that affective patterns acquired in early childhood are repeated throughout life. However, today there is evidence that the so-called Insecure attachment patterns can be changed by resilience and protective factors (Vučinić et al., 2013). In today's world, screen technologies have become an inseparable part of everyday life and are significantly transforming the way young people relate to their environment. Although technological advances bring numerous benefits, excessive use of screen devices can lead to screen addiction, which brings a range of cognitive, emotional, and social challenges (Alexandrov, Manolova, and Vezekov, 2025). Children are increasingly exposed to screens from an early age, which is causing growing concern among experts and parents about the impact of screen addiction on cognitive, emotional, social, and language development. Numerous studies indicate that early childhood screen addiction can lead to serious deficits in social interaction and communication (Mateev, Manolova and Vezekov, 2025). Over the past decade, there has been a growing body of evidence suggesting a direct correlation between early, intense exposure to screens and impairments in language development. Research shows that children who develop screen addiction before the age of two are at increased risk of delayed language development and social dysfunction. (Yuan et al., 2024; Anjum et al., 2024; Vogindroukas et al., 2022)

Despite numerous studies, debate continues regarding the effects of media on children's development about the effects of media on neurocognitive development – particularly social, language and cognitive development in preschool children, especially before the age of two (Kim et al., 2023; Shaik Mahammad Rafi et al., 2024). Early exposure to media can negatively impact social development due to lost time for communication and interaction with parents, as well as for creative play. Media is known to negatively impact a child's development even when they are only passively exposed to media content that their parents watch in the background. It is thought that watching media programs before the age of 2 negatively impacts early brain development, due to infants' limited capacities for memory, attention and cognition (Kim et al., 2023).

Research by Munamala et al. (2024) showed that children who had less screen time performed better in all areas of social skills (cooperation, assertiveness, responsibility, empathy, and self-control). This suggests that limited screen time provides more opportunities for direct face-to-face interactions and participation in social activities, which are crucial for the development of these skills. On the other hand, children who spent more time in front of screens performed the lowest results, suggesting that prolonged screen time may hinder the development of basic social skills. Children who had moderate screen time performed in the middle, further reinforcing the thesis that the amount of time spent in front of screens is directly proportional to the level of development of social skills (Reddy Munamala et al., 2024).

Methodology

Subject and purpose of the research

The subject of this research is the development of social interaction and communication in children who were exposed to digital screens early, with a special focus on the age of first exposure and the duration of exposure as potential influencing factors.

The aim of the research is to investigate the relationship between the age of first exposure to screens, the length of exposure and the development of social interaction and communication.

Sample

The research was conducted on a suitable (convenient) sample of 66 children, all included in rehabilitation treatment due to diagnosed disorders in speech-language development. The treatment is implemented at the Center for Rehabilitation of Verbal Communication Pathology - Skopje. The observation process begins at the age of 30 to 36 months, i.e. at the moment of the children's inclusion in the rehabilitation process. Documentary records from clinical files, as well as structured observation of social interaction and communication, were used for data collection. In terms of demographic distribution, only 2 children (3%) come from a rural area, while the remaining 64 children (97%) are from an urban area. All children live with both parents, of which 35 (53%) live in a primary family, and 31 children (47%) live in an extended family with the father's parents. In terms of parental employment, only 7.6% are employed on a fixed-term basis, while all the rest are on an indefinite-term basis; there are no unemployed parents. In terms of educational structure, 62.1% of parents have higher education, and 37.9% have secondary education.

The subjects were divided into three groups according to the age of first exposure to digital screens: The first group consisted of 24 children (20 males and 4 females), who were exposed to excessive

screen time before the first year. The second group consisted of 22 children (19 males and 3 females), who were exposed to excessive screen time between the first and second year, and the third group consisted of 20 children (all 20 males), who were exposed to excessive screen time after the second year. The average daily exposure of the children in the first group was 3.79 hours, with a standard deviation of 1.215 hours, while the average time period of exposure was 29.79 months, with a standard deviation of 7.547 months. The children were exposed from 2 to 6 hours per day, most often 3 hours, and the shortest period of exposure was 12 months, while the longest was 43 months. Most children in this group were exposed to screens for 24 months. Children in the second group were exposed to screens for an average of 3.18 hours per day, with a standard deviation of 0.795 hours, over an average period of 19.14 months and a standard deviation of 5.922 months. The exposure of these children varied from a minimum of 1 hour per day and a period of 12 months, to 4 hours per day and a period of 30 months, and most often 3 hours and a period of 24 months. The average daily exposure of children in the third group was 3.35 hours, with a standard deviation of 0.745 hours, over an average period of exposure of 21.80 months, with a standard deviation of 5.327 months. Children were exposed for 2 to 5 hours per day, from 12 months to a maximum of 30 months. Most often, children in this group were exposed to screens for 3 hours per day and a period of 24 months.

Statistical analysis

All data obtained from the study were statistically processed using the IBM SPSS Statistics software package, version 26. Demographic and clinical characteristics of the respondents are presented as mean values with standard deviation ($M \pm SD$) for continuous variables, or as absolute numbers and percentages for categorical data. To assess group differences in terms of average daily and cumulative screen exposure, according to age of first exposure, a one-way analysis of variance (ANOVA) was applied.

Results

The assessment of social interaction was based on several clinical indicators: establishing and maintaining eye contact, responding to one's own name, the presence of joint attention, as well as the level of social engagement, manifested through isolation and self-absorption. Additionally, interest in play and the type of play (symbolic, constructive, sensory-oriented) were analyzed, as indicators of social-cognitive maturity.

First group

In children who were exposed to excessive screen time before the age of one year, significant difficulties were recorded in the domain of social communication and interaction, as well as pronounced deficits in speech development and verbal communication.

Table 1. Disturbances in social communication and interaction in children from the first group (N = 24)

Characteristic	Category	N (%)
Eye contact	Does not establish	20 (83.3%)
Eye contact	Establishes	4 (16.7%)
Reaction to own name	No	19 (79.2%)
Reaction to own name	Difficult	3 (12.5%)

Reaction to own name	Yes	2 (8.3%)
Joint attention	Absent	24 (100.0%)
Isolation	Yes	22 (91.7%)
Isolation	Sometimes	2 (8.3%)
Self-absorption	Yes	22 (91.7%)
Self-absorption	Sometimes	2 (8.3%)
Interest in play	Absent	21 (87.5%)
Interest in play	Present	3 (12.5%)
Stereotyped play	Present	9 (37.5%)
Stereotyped play	Absent	15 (62.5%)
Functional play	Present	12 (50.0%)
Functional play	Absent	12 (50.0%)
Imaginative play	Absent	24 (100.0%)

As shown in Table 1, a significant proportion of children in the first group show pronounced deficits in the domain of social interaction. As many as 83.3% of children do not establish eye contact during communication, and 79.2% do not respond to being called by name, while only 8.3% respond appropriately. Moreover, joint attention is completely absent in all children (100%). In terms of social involvement, 91.7% of children are isolated and absorbed in themselves, which further indicates a low level of interactive interest. Play, as a key developmental indicator, is also impaired: 87.5% of children show no interest in play, although 37.5% demonstrate stereotypical forms of play, while functional play is present in half of the respondents (50%). It is important to emphasize that imaginative (symbolic) play is not present in any child in this group (100%), which indicates a significant delay in symbolic processing and social-cognitive development.

Second group

In the second group of respondents, consisting of children who were exposed to screen stimulation between the first and second year of life, numerous difficulties related to excessive and early exposure to digital screens and difficulties in social interaction, communication behavior were identified.

Table 2. Disturbances in social communication and interaction in children from the second group (N = 22)

Characteristic	Category	N (%)
Eye contact	Does not establish	18 (81.8%)
	Hardly establishes	1 (4.5%)
	Establishes	3 (13.6%)
Turns to name	No	15 (68.2%)
	Hardly	5 (22.7%)
	Yes	2 (9.1%)
Attention focused	No	18 (81.8%)
	Sometimes	4 (18.2%)
Isolation	Sometimes	4 (18.2%)
	Yes	18 (81.8%)
Self-absorption	Sometimes	3 (13.6%)
	Yes	19 (86.4%)
Not interested in play	No	21 (95.5%)
	Yes	1 (4.5%)
Stereotyped play	No	15 (68.2%)
	Yes	7 (31.8%)
Functional play	No	8 (36.4%)

Table 7 presents the results of the observation of aspects of social communication and interaction in children who were exposed to screen stimulation between the first and second years of life (second group, N = 22). The majority of children do not establish eye contact during social interaction (81.8%), while 13.6% do, although in one child (4.5%) it is significantly impaired. Responsiveness to one's own name is also impaired: 68.2% of children do not react by turning when they hear their name, and only 9.1% of them show an appropriate reaction without difficulty. Joint attention is seriously impaired: as many as 81.8% of children do not demonstrate this form of social monitoring at all, while only 18.2% show occasional attempts. Social isolation is also pronounced – 81.8% of children are constantly isolated, and the same percentage are in a increased internal preoccupation. In terms of play, 95.5% of children show interest in playing, which indicates a potential opportunity for engagement, but play is often qualitatively impaired. Stereotypical play is observed in 31.8% of children, and dysfunctional play in 36.4%. Imaginative (symbolic) play is completely absent in all respondents

Third group

In children from the third group who were exposed to excessive screen time after the age of two, the state of social communication and interaction is much better compared to the previous two groups, as we did not detect any impairments in the analyzed types.

Table 3. Impairment of social communication and interaction in the third group (N = 20)

Characteristic	Category	N (%)
Eye contact	Yes	20 (100.0)
Turns to name	Yes	20 (100.0)
Focused attention	Yes	20 (100.0)
Isolation	No	20 (100.0)
Self-absorption	No	20 (100.0)
Disinterest in play	No	20 (100.0)
Stereotyped play	No	20 (100.0)
Functional play	No	20 (100.0)
Imaginative play	Yes	20 (100.0)

As shown in Table 3, in the third group of children – those who were exposed to screens after the age of two, no impairments in the area of social communication and interaction were recorded. All examined children establish adequate eye contact, respond to their name, and demonstrate joint attention, which indicates the presence of basic social skills and a developed ability to orient to other people and social signals. In addition, no child was assessed as socially isolated or self-absorbed, which differs from the high frequency of these patterns in the first and second groups. Also, all children have an interest in play, which is assessed as imaginative, without the presence of stereotypical or limited functional patterns. This is a key indicator of typical cognitive and socioemotional development, given that imaginative play is closely related to theory of mind, symbolic representation, and social creativity (Lillard, 2007). The results suggest that the timing of initial screen exposure plays a critical role in the development of social functions. In the third group, which began using digital devices after the second year of life, when the basic structures of social interaction are already in place, no significant deficits were observed. This suggests that the timing of the start of digital exposure is a potential protective factor if it is delayed after the critical period of early socialization (AAP, 2016; Madigan et al., 2019). This result is consistent with research showing that screen exposure before the second year of life is associated with impaired

socio-emotional development, while moderate and controlled exposure after that period does not carry the same risks, provided that it is balanced with real-life interactions and play (Radesky et al., 2020).

Discussion

Recently, with the rapid development of various screen devices, especially smartphones, it has become common for infants and young children to be exposed to media for extended periods of time from a very early age (Certain, Kahn, 2002; Zimmerman et al., 2007). Although there is debate about the relationship between screen exposure and neurodevelopment in children, Screen exposure at this age primarily involves visual stimuli and has negative effects, especially before the age of two, as children at this age still have difficulty understanding media content (Christakis, 2020; Christakis, 2009; Cho et al., 2017; Ma et al., (2022).). The results of this study clearly indicate a significant relationship between screen time and the development of social interaction and communication in children. Profound deficits in the domain of social interaction are evident in children who were exposed to screen stimulation in the critical period between the first and second years of life (first and second groups), in contrast to those who were exposed after the age of two (third group). In the first group, it is worrying that 83.3% of children do not establish eye contact, and 79.2% do not respond to being called by name, which represents a basic deficit in social attention orientation. Confirmation of the severity of these disorders is the complete absence of joint attention (100%), which is one of the earliest indicators of Theory of Mind development. Social isolation is also pronounced, 91.7% of children are isolated, with a low level of interactive initiative. Although half of the children (50%) show functional play, it is important to emphasize the absence of imaginative play (100%), which indicates a significant delay in symbolic and social creativity. Similar results were obtained in the second group, in which children were exposed to screens during the critical period of 12 to 24 months. Although 95.5% of the children showed interest in play, in the majority it was qualitatively impaired, with dominant stereotypical play (31.8%) and dysfunctional play (36.4%). Again, imaginative play was completely absent, and joint attention was seriously impaired in 81.8%. Isolation and preoccupation were also present in the same percentage (81.8%) of the children, indicating an absence of social interaction and communication. In contrast to these data, the results from the third group, where children were exposed to screens after the age of two. These children showed no social-communication disorders. On the contrary, they all demonstrated adequate visual contact, responsiveness to name calling, and joint attention. Also, the play of all children was assessed as imaginative, without the presence of stereotypy or dysfunction. These findings support a growing body of evidence suggesting that early and uncontrolled exposure to screens may have a negative impact on critical aspects of social interaction and communication, particularly when it occurs during the formation of basic social mechanisms such as joint attention, eye contact, and symbolic play. The presence of interest in play in the latter group suggests potential for rehabilitation, but the qualitative deficits in play leave room for concern. Research using functional magnetic resonance imaging has shown that Interaction with people activates children's brain development much more effectively than screen exposure, as screens mainly stimulate only the visual cortex, without activating cognitive processes (Christakis, 2009; Anderson & Pempek, 2005). Heffler & Oestreicher (2016), suggest that media exposure may interfere with the development of brain structures related to social development and create new brain pathways that lead to further screen addiction. A study by Kim et al. (2023) found that children with social developmental delays were more likely to be exposed

to media for more than 2 hours per day and had early exposure before 24 months of age, compared to typically developing children. It also found that allowing children to watch screen content independently, without interaction with their caregivers, may have a negative impact on their social development (Kim et al., 2023). Shaocong et al., (2024) examined screen time and social competence in children from Taiwanese-Chinese families. The results showed that screen time has a negative impact on social interaction and communication. The analysis showed that when parents engage in interactions with their children less often, children tend to spend more time in front of screens, which then leads to poorer development of social competence in early childhood.

Conclusion

The results of this study point to a clear and worrying link between early exposure to screens and impairments in social communication and interaction in children. The most pronounced deficits were observed in children who were exposed to screen stimulation during the sensitive period between the first and second years of life, with almost all respondents showing a lack of joint attention, reduced responsiveness to name calling, impaired eye contact and pronounced social isolation. Of particular concern is the absence of imaginative play, which indicates serious difficulties in symbolic thinking and social creativity. On the other hand, children who were exposed to screens after the age of two do not show significant impairments in any of the assessed aspects, which indicates that the time period of exposure is a key factor in influencing the development of social skills. These findings highlight the importance of controlling and limiting early screen use and emphasize the need to actively engage children in interactive, linguistically and socially rich environments in the earliest years of life, as well as to monitor the development of higher forms of social interaction and communication. The research has implications for clinical practice, educational policies and parent education, especially in terms of prevention, early detection and early intervention in children at risk of social-communication deficits. Future research should examine the long-term consequences of screen exposure on the overall development of children, as well as the effectiveness of early interventions aimed at rehabilitating social interaction and communication disorders.

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